ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2003—ISSUE NO.1 PAGES 2757-2784

Unknown CCD

BY E NEWMAN

Finding a previously unknown American gold counterfeit detector created in 1849 was like learning that an extinct species of animal is very much alive. This newly-located weighing device is distinctive in that it incorporates one swinging arm to accommodate some denominations of US gold coins, while the beam to which that arm is attached holds the others. Only a hint of its possible existence has been available, but that hint had been unnoticed. To understand the unique status of this device we first look at its predecessors.

Predecessors in U.S.

During the American colonial period and well into the first half of the 19th century in the United States, equal-arm balances in a pocket-sized box or case were used to test the weight of foreign coins in circulation. The results were compared to tables specifying the correct weight of the coins. The only other protections against counterfeits were careful observation and a simple vibration test (that is, a coin was either balanced and tapped or spun on a hard surface to check if it had a ringing sound.) Casting, alloying and plating of counterfeits steadily became more sophisticated and thus improved accuracy in testing became necessary. A counterfeit composed of other metals could also be increased in size (either diameter or thickness) to produce a proper weight in an attempt to deceive the tester.

Predecessors in England

Mechanics, rarely in England in the late 18th century and prolifically in the 19th century, had rarely developed pocket-sized brass balances containing two holders [platters] for the two current gold coins cut into the beam at proper distances on one side of the fulcrum and a fixed poise [counterweight] on the other side. The moment [tipping] created by either denomination of a genuine gold coin being tested would be the same and would balance the poise. Horizontal, circular holders of the exact circumference of a genuine coin were countersunk into the beam to test the diameter. A slot equal in width to the thickness of the genuine coin was cut across the diameter of each coin holder so that thickness could be checked. This was called a slot gauge. A chord, or arc, was commonly cut away from part of the circumference of each coin holder on opposite sides of the beam so that a coin could easily be lifted out of the holder with finger and thumb. The fulcrum on which the beam rested was mounted on a brass base and such a device was called a rocker because of its seesaw movement on the fulcrum. See Fig. 1.

Fig. 1. A typical English counterfeit coin detector, c.1830, made by the most prolific maker of such rockers. English rocker for the sovereign and ½ sovereign, made by Samuel Harrison, working 1825-1833. Courtesy D Crawforth-Hitchins

The first detector for U.S. gold coinage

The first American counterfeit coin detector (any mechanical detector is hereafter referred to as a CCD) copied such English principles and was produced in 1834 by T Moore of Philadelphia to test the U.S. $2.50 and the $5 of the new size and weight (III-2-4).[1] See Fig. 2. This device did not

check a U.S. $10 because no $10 U.S. gold coin had been struck since 1804 and other U.S. gold coins from earlier years had been withdrawn from normal circulation by banks because their intrinsic value was higher than their face value. Moore's CCD was made with and without the name of the maker punched onto the poise. Sometimes the word PATENT appeared on the base even though no patent was ever issued. It was about 3.9 inches (96mm) in length and about 0.8 inches in height, so it readily fitted into the pocket or pouch.

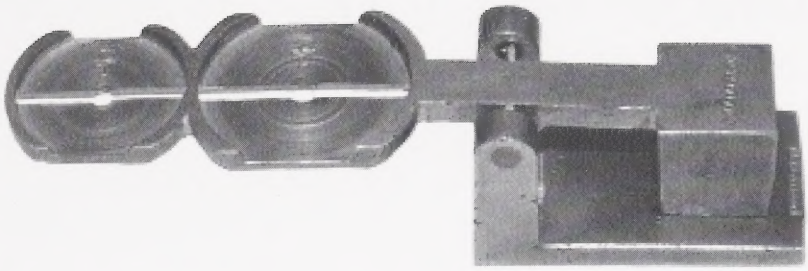


Fig. 2. ⅄⅄ Moore's Patent Eagle Balance of 1834, for the 1/2 eagle [U.S. $5] and the 1/4 eagle [$2.50] coins.

Just prior to the major discoveries of gold in California in 1848, only three denominations of U.S. gold coinage had been struck: the $2.50 (quarter eagle), the $5 (half eagle), and the $10 (eagle). When large quantities of California gold became available for U.S. coinage, Congress authorized the Mint to add $1 and $20 denominations pursuant to the Act of March 3, 1849. At that time foreign gold coins circulated extensively in the United States, and counterfeiting and tampering had become a major problem. The modest amount of U.S. gold coins then in circulation was not substantially targeted by counterfeiters. But when production of U.S. gold coinage was to increase greatly and foreign gold coins in American circulation were to be phased out, immediate and improved protection was needed against counterfeit and underweight U.S. gold coins.

In 1849 however, the size of any new CCD became a problem because of the need to accommodate the five different gold coins ($20, $10, $5, $2.50, and $1) which were, or were about to be, in circulation. The $20 double eagle was 20 times the mass of the $1 gold piece. In order to use a rocker similar to Moore's or of an English type, the distance of the center point of the $1 coin holder would have to be 20 times farther from the fulcrum than the center point of the $20 coin holder to provide the same moment for balancing a full-weight coin. That would require a balance beam of about 15 inches long (obviously, to reduce beam length the $20 coin holder would be positioned as close to the fulcrum as practical). Making a pocket-sized CCD similar to previous rockers seemed unworkable. It was realized that placing the coin-holders on both sides of the fulcrum would allow the other end of the rocker to act as the poise. Alternatively, the rocker would require an adjustable counterweight or a sliding or separate poise.

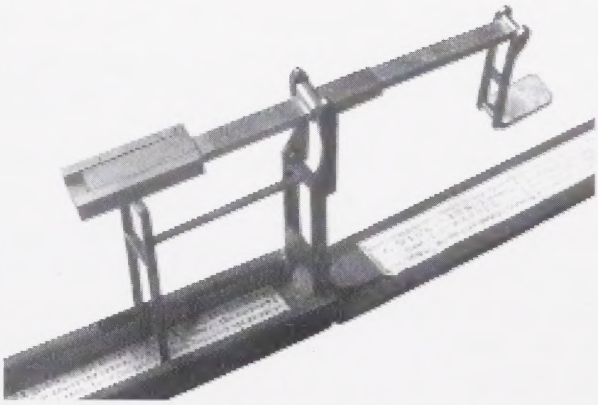


Fig. 3. ⅄⅄ Folding gold balance by Anthony Wilkinson of Kirkby in England, made before 1785. The turn away from the fulcrum for the guinea, and the turn towards the fulcrum for the half-guinea. A slide indicated the number of grains of gold lost from the coin.

Beginning in the 18th century, the English had successfully employed a single coin holder on one side of the fulcrum for weighing one of several gold denominations and attached on the top of the counterweight side of the fulcrum a small, swinging poise (or poises) on a horizontal hinge, enabling the moment for balancing to be changed manually by turning over one or more swinging poises 180 degrees on the hinge pin or pins. Any such poise was called then a turnover or a turn. See Fig. 3

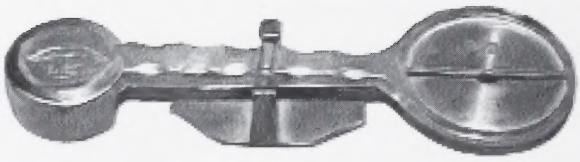


Fig. 4. ⮝⮝ Anonymous CCD for the $20 only. Made about 1849. The poise is stamped with an eagle with outspread wings.
Courtesy Bill Doniger

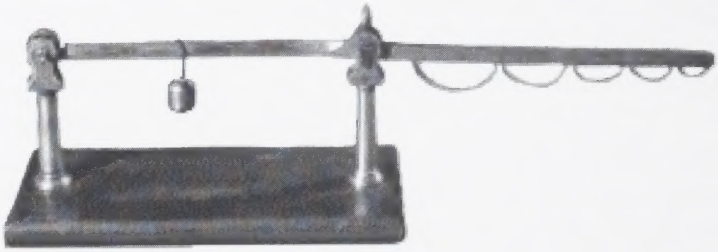
The impact of increased U.S. gold coinage

Several American mechanical designers during the period of 1849-1850 attempted to solve the American gold coin-testing problem in different ways. A rocker for only the $20 coin was produced (III-2-12). See Fig. 4.

K & G Howard of Philadelphia made a rocker limited to testing the $5, $2.50, and $1 denominations (III-2-17 and C 9). No photograph is available.

W N Snider, a machinist who worked for the U.S. Mint in Philadelphia, made a countertop gold coin scale for all five denominations using (a) combined thickness and diameter slots running end to end along the center line of the load side of the beam; (b) thin flexible metal straps beneath the slots to support the coins in a vertical position; and (c) a movable poise suspended on the beam and locating in the graduated notches on the other side of the fulcrum. See Fig. 6.

Fig. 5. ⮟⮟ Tabletop CCD by W N Snider. The end bracket, that prevents the beam from dropping too far, is a replacement.
Courtesy M A Murphy & M Spence



John Allender of New London, Connecticut, cut three smaller denomination coin holders into the beam on one side of the fulcrum and the two larger denomination coin holders into the beam on the other side of the fulcrum, but had to add a separate poise to fit into the $1 coin holder when the larger denomination coins were tested (IV-I-10). Fig. 6. Allender's device was about 8.5 inches (216mm) long, somewhat larger than the desired pocket size.

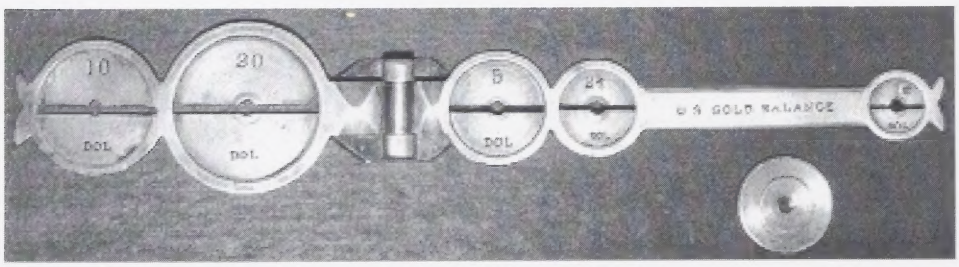


Fig. 6. ⮜⮜ Allender Gold Balance of 1850, with coin holders on each side of the fulcrum. Its separate circular poise was to be placed in the $1 coin holder only while testing the $10 and $20 coins.

The newly-discovered CCD, fig. 7, has two coin holders on its one swinging arm and its maker was identified only with a capital **H** punched in the top of that arm. Fig. 8. I attribute it to George Howard because the CCD punched with K & G HOWARD PHIL is very similar in shape and workmanship.

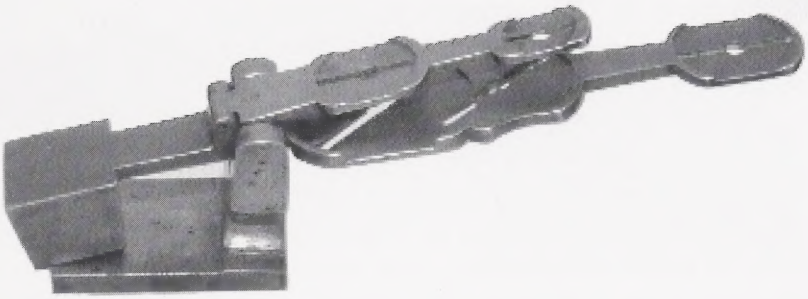


Fig. 7. ⅄⅄ The **H** CCD of 1849, showing the swinging arm partly raised.

The name of G Howard is first listed in Philadelphia directories in 1845 as a machinist at Broad and Paper Streets. In later listings the name became George Howard and then George C Howard. However, there is no K Howard listed in Philadelphia directories, but he may have been an older relative of George Howard. George Howard must have been very ingenious because he broadened the scope of his occupation to mechanical engineer as his business grew and he soon occupied three lots on South 18th Street below Market Street. He advertised in 1862 as a maker of tools for machinists, factories, railroad repair yards, etc. His listings ceased in 1880.

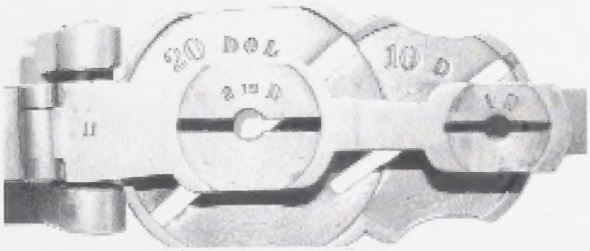


Fig. 8. ⅄⅄ Close-up of Fig. 7, the H CCD, showing the small H over the fulcrum. The 5 D holder is out of sight on the right.

Allender demonstrated his familiarity with the **H** CCD when he commented in his March 26, 1850 patent application:

I am aware that balances for proving coin have been made with two levers hung upon one fulcrum so arranged as to weigh all the coins upon one side of said fulcrum, and when the larger coins were weighed the lever in which the small ones are weighed is turned to the opposite side of the fulcrum. Therefore I make no claim to instruments constructed with more than one lever and to weigh upon one side of the fulcrum only.

There are some technical ambiguities in Allender's language as he attempts to distinguish his device from previous rockers:

(a) Two separate levers could be hung side by side on one fulcrum with different coin holders and would operate independently of one another.

(b) A swinging arm attached to or laying on top of a basic lever is only a part of a lever and not a lever itself.

(c) When a swinging arm is turned to the opposite side of the fulcrum the arm merely changes the movement on both sides and is still a part of the basic lever and performs no independent leverage.

What Allender intended to say was that he was not claiming originality for a swinging arm which enabled and required coins to be tested only on one side of the fulcrum but was claiming originality for his way of testing some denominations on one side of the fulcrum and other denominations on the opposite side of the fulcrum. The description (a) obviously referred to the **H** CCD that had

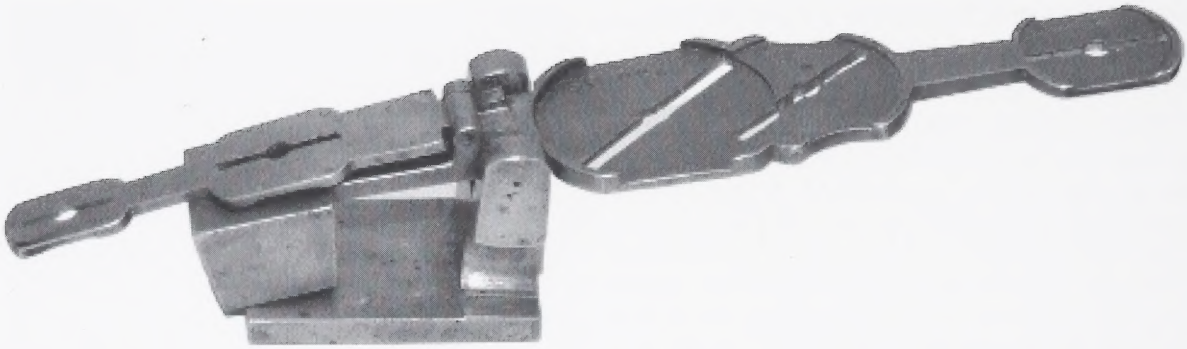


Fig. 9. ⮝⮝ The **H** CCD showing the single arm swung over to the left side, to increase the mass on the left of the fulcrum, and thus balance the 20 dollar and 10 dollar coins.

recently appeared. Allender's description of his earlier device was repeated unchanged in the language of the patent issued to him on November 27, 1855 (II-2-9A and IV-1-26).

The **H** CCD was and is revolutionary and distinctive because the swinging arm, that contained two of the smaller-sized coin holders, transferred the poise, in effect, from one side of the fulcrum to the other. (The turns used on earlier English folding guinea balances were small, were placed and normally remained after movement only on one side of the fulcrum, and never contained any coin holders.) When the swinging arm of the **H** CCD had its smaller-size coin holders facing upward, it covered some of the other coin holders on the beam below so that they were then blocked from use for testing. See Fig. 7. When that arm was swung over on its hinge across the fulcrum, its mass changed from one side of the fulcrum to the other and exposed the larger coin holders for use in testing. See Fig. 9. The hinge was attached to the beam almost over the top of the fulcrum.

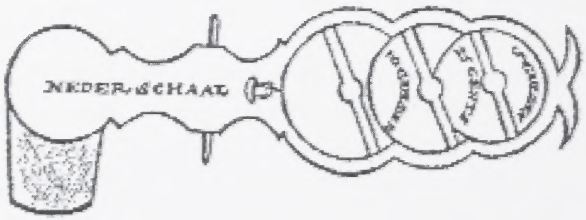


Fig. 10. ➢➢ Although there is no evidence that Ellinckhausen's rocker of 1829 had been seen by any American, his solution for testing the diameter and thickness of coins of similar weight was the same as **H** used. He put the slots on the diagonal, and overlapped the coin holders. The Dutch coins to be tested were the 10 guilden, 25 cents and 5 guilden.

From M A Crawforth's *Sovereign Balances*

Therefore the mass of the swinging arm of the **H** CCD had to be arranged with precision because it performed a function on each side of the fulcrum. It was reasonably easy to adjust the moment of a balance beam by reducing the side that was too heavy by filing or buffing off some of its undersides, but, in the case of a swinging arm that was too light, the procedure became complicated. If the maker adjusted the poise side of

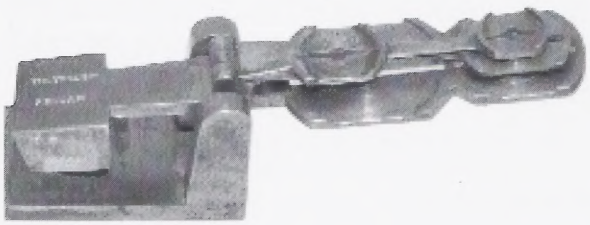


Fig. 11. ⮜⮜ Meyer's 1850 CCD showing its two swinging arms with their coin holders partly covering the beam's coin holders. When a $1 coin was to be weighed, the poise was largely balanced by the mass of the two swinging arms, plus the mass of the beam, so the added weight of one little dollar was enough to tip the rocker.

the beam on which the arm sometimes rested, a further adjustment of the beam on the larger coin holder side might be required. The mass of brass used for casting parts could not be relied upon because the countersinking of coin holders and the cutting of slot gauges and finger cut-outs resulted in substantial weight changes.

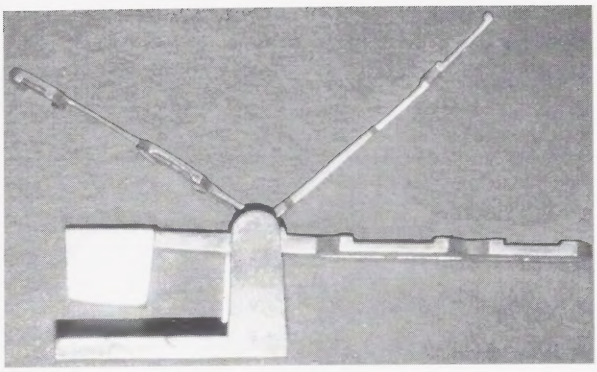


Fig. 12. ⅄⅄ F Meyers & Co's two swinging arms.

Thus, getting the arm equally accurate in both positions required careful handiwork, increasing the cost. To reduce the beam length, the **H** CCD crowded the $20 coin holder close to the fulcrum, causing the $10 coin holder to overlap the $20 coin holder and the slot gauges to be cut on the diagonal instead of along the center line of the beam, in the same way as Ellinckhuysen did on his Dutch rocker of 1829. See Fig. 10.

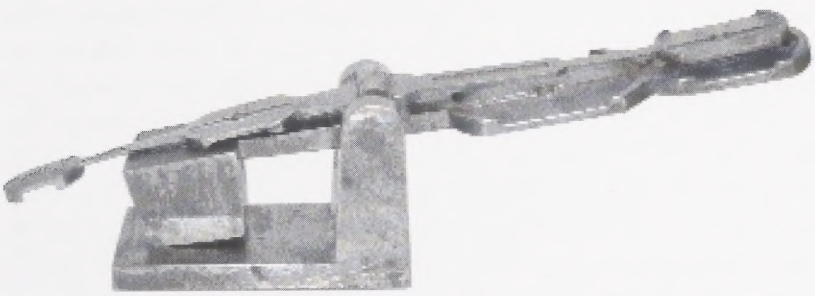


Fig. 13. ⅄⅄ F Meyers & Co CCD with the top arm swung over to the left. Because the slots of each arm align with those below, and those below are larger, it is possible to test the thickness of every coin while its holder is to the right.

Frederick Meyers (or Meyer, Myer or Myers) of Philadelphia promptly improved the **H** CCD by making the beam shorter; eliminating the overlap of the $10 coin holder over the $20 coin holder; and realigning the position of the diagonal slot gauges (III-2-13, etc.) This was accomplished by adding a second swinging arm to accommodate the $5 coin holder. See Fig. 11. The second swinging arm was on the same hinge pin that held the first swinging arm containing the $2.50 and $1 coin holders. The beam was shortened to accommodate only the $20 and $10 coin holders. This enabled the position of the $20 coin holder to be far enough from the fulcrum to eliminate the overlap with the $10 coin holder. Because Meyers had transferred the position of the $5 coin holder from the beam to a second swinging arm, the length of his device was shorter than the **H** CCD by about one inch (24mm). A more complex and desirable CCD was the result, but it required even more labor and adjustment than the **H** CCD.

Emphasis on low cost

Meanwhile Allender stressed the low cost of his CCD. He could have added a simple turnover without any coin holder on it to take the place of the separate weight he provided,

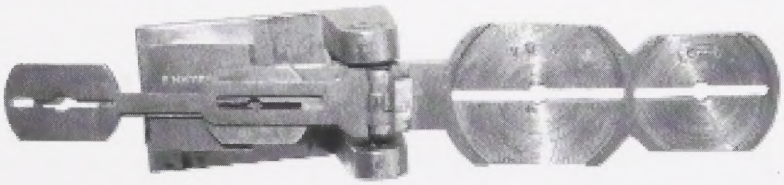


Fig. 14. ⅄⅄ F Meyers & Co CCD with both arms turned to the left. The 20 dollar and 10 dollar coins are so heavy that only the use of the poise plus the two arms provide sufficient mass to balance them.

since there was adequate space to do so on the smaller coin side of the beam between the $2.50 and $1 coin holders. Presumably he chose not to pursue that option because he was concerned about the production cost. In his patent application filed March 26, 1850, he stated:
This apparatus can be made and sold cheaper than any other that will perform the same service with the same facility.

This cost factor was independently confirmed by a letter from the United States Mint to the U.S. Patent Office dated January 10, 1855 (IV-1-17), in which it is stated with respect to the price paid by the Mint for an Allender CCD: *The cost was trifling.*

The production costs of the **H** CCD and Meyers' CCD were far in excess of the cost of Allender's CCD. Allender continually sold large quantities of his device. For the two new coins minted in 1853, he added a second depression for the new $1 coin and for the $3 coin, a coin holder between and to one side of the $5 and $2.50 holders. For those who had purchased his detectors before the $3 denomination was coined, he sold a brass bush (of $2 mass) to fit into the $5 coin platter to enable $3 pieces to be tested. He also changed the punched-in lettering on the beam from time to time. His remarkable products are in many collections today.

The **H** CCD and Meyers' CCD are the only examples known of each device. This indicates that the public chose Allender's CCDs because of their price, even though they were too long to be carried easily in the pocket and in spite of the fact that the separate weight was often mislaid or lost. The rare survival of the **H** CCD and the Meyers CCD also indicates that very few of them were either made or sold. As is said in the medical profession, *The operation was a major success but the patient died.*

The reasons for and dates of production of many of the foregoing CCDs are confirmed by J R Eckfeldt and W E Dubois, assayers at the U.S. Mint, in their publications from 1849 through 1852 as follows:
As the balance is not a very portable or ready apparatus, several instruments have been contrived expressly for the purpose of combining the tests of weight and dimensions. They are all no doubt worth examining.

Is the **H** CCD really so rare as to be unique? Has anyone previously known of one? If so, I would be grateful to learn of it. On a "scale" of 1 to 10, the **H** and Meyers' CCDs seem to be 12s because they are so amazingly clever and distinctive. No coin holders on swinging arms have been reported attached to beams on any CCD elsewhere. The newly-found **H** CCD can now take a distinguished place in American numismatic, metrological and Gold Rush history.

Acknowledgements
Tom Serfass kindly took the pictures, while Eric was recovering from eye surgery.

References
1. Newman, E P, & Mallis A G, *U.S. Coin Scales and Counterfeit Coin Detectors*, self-pub, 1999.
2. Crawforth, M A, *Sovereign Balances, 1, Standard Rockers*, self-pub, 1984, revised 2001.

Eric Newman's Biography
Eric is an authority on American coins, so CCDs and coin scales are a subsidiary enthusiasm, developed with his friend, the late George Mallis. While George's health was failing, Eric encouraged George sufficiently to finish their book, THE reference book on U.S. Coin Scales and Counterfeit Coin Detectors.